

# MONTHLY WEATHER REVIEW

Editor, EDGAR W. WOOLARD

VOL. 68, No. 1  
W. B. No. 1287

JANUARY 1940

CLOSED MARCH 4, 1940  
ISSUED APRIL 9, 1940

## A BRIEF LIST OF WORKS ON METEOROLOGY

Compiled by RICHMOND T. ZOCH

### POPULAR AND ELEMENTARY WORKS

- Boy scouts of America. Weather. New York. 1928. (Merit badge series 3816.) [By W. J. Humphreys and C. F. Talman.]  
Botley, C. M. The Air and its mysteries. London. 1938.  
Brooks, Charles F. Why the weather? Rev. and enl. New York. 1935.  
Brooks, C. E. P. The weather. London. 1927.  
Brunt, David. Meteorology. London. 1928.  
Brunt, David. Weather science for everybody. London. 1936.  
Defant, A. Meteorologie. Berlin. 1929.  
Ficker, H. von. Wetter und Wetterentwicklung. Berlin. 1932.  
Humphreys, W. J. Weather rambles. Baltimore. 1937.  
Pick, W. H. A short course in elementary meteorology. 4th ed. London. 1933. (Great Britain, Meteorological Office. M. O. 247.)  
Pickwell, Gale. Weather. Los Angeles, 1937.  
Rouch, J. L'Atmosphère et la prévision du temps. Paris. 1923.  
Shaw, Sir Napier. The drama of weather. 2d ed. Cambridge. 1939.  
Talman, Charles Fitzhugh. A book about the weather. New York. 1935. [Previously published as: The realm of the air. Indianapolis. 1931.]  
Talman, Charles Fitzhugh. The story of our weather. New York. 1930. [Previously published as: Our weather: what makes it and how to watch it. (A volume in Collier's Popular Science Library.) Also as Meteorology, The science of the atmosphere. 1922.]  
Trewartha, Glenn T. An introduction to weather and climate. New York. 1937.  
Watson, R. A. Through the weather house. London. 1935.

### GENERAL TREATISES

- Angot, Alfred. Traité élémentaire de météorologie. 4th ed. Paris. 1928.  
Blair, Thomas A. Weather elements. New York. 1937.  
Bornstein, R. Leitfaden der wetterkunde. 4th ed. Braunschweig. 1927.  
Geddes, A. E. M. Meteorology; an introductory treatise. London. 1921.  
Hann, J. von, & Süring, R. Lehrbuch der meteorologie. 4th ed. Leipzig. 1926. (5th ed. Now in course of publication in parts.)  
Humphreys, William J. Physics of the air. 2d ed. New York. 1929.  
Linke, Franz, ed. Meteorologisches Taschenbuch. 5 vols. Leipzig. 1931-1939.  
Milham, Willis I. Meteorology. New York. 1912.  
National research council. Physics of the earth. III. Meteorology. Washington. 1931.  
Shaw, Sir Napier. Manual of meteorology. 4 vols. Cambridge. 1926-1931. (2d vol. revised 1936.)  
Süring, R. Leitfaden der meteorologie. Leipzig. 1927.

### CLOUDS

- Clarke, George A. Clouds. London. 1920.  
Clayden, Arthur William. Cloud studies. 2d ed. London. 1925.  
Great Britain, Meteorological office. Cloud forms according to the international classification. 3d ed. London. 1934.  
Humphreys, William J. Fogs and clouds. Baltimore. 1926.  
International meteorological committee. International atlas of clouds and of states of the sky. Paris. Abridged ed. for the use of observers. 1930. Complete ed. I. General atlas; II. Atlas of tropical clouds. 1932.

- Süring, R. Die wolken. Leipzig. 1936.  
U. S. Weather Bureau. Cloud forms. 3d ed. 1938.  
U. S. Weather Bureau. Codes for cloud forms and states of the sky. Washington. 1938.

### DYNAMIC METEOROLOGY

- Abbe, Cleveland. The mechanics of the earth's atmosphere. A collection of translations. (2d collection.) Washington. 1891. Third collection. Washington. 1910. [Published by Smithsonian Institution.]  
Bjerknes, V., et al. Physikalische Hydrodynamik, mit anwendung auf die dynamische meteorologie. Berlin. 1933. (Also translated into French.)  
Brillouin, M. Mémoires originaux sur la circulation générale de l'atmosphère. Paris. 1900.  
Brunt, David. Physical and dynamical meteorology. 2d ed. Cambridge. 1939.  
Carnegie Institution of Washington. Publication No. 88. Bjerknes & Sandstrom. Pt. I. Statics. 1910. Hesselberg & Devik. Pt. II. Kinematics. 1911.  
Ertel, H. Methoden und probleme der dynamischen meteorologie. Berlin. 1938.  
Exner, Felix M. Dynamische meteorologie. 2d ed. Wien. 1925.  
Ferrel, William. Recent advances in meteorology. Washington. 1886. (Annual report of the Chief Signal Officer. 1885. Appendix 71.)  
Hildebrandsson, H., & Teisserenc de Bort, L. Les Bases de la météorologie dynamique. 2 vols. Paris. 1898-1907.  
Koschmieder, H. Dynamische meteorologie. Leipzig. 1933.  
Sprung, A. Lehrbuch der meteorologie. Hamburg. 1885.  
Stüve, G. Thermodynamik der Atmosphäre. Berlin. 1937.  
Wegener, A. Thermodynamik der atmosphäre. Leipzig. 1911.

### WEATHER AND WEATHER FORECASTING

- Abercromby, Ralph. Weather; the nature of weather changes from day to day. Revised by A. H. R. Goldie. London. 1934.  
Balldit, Albert. Études élémentaires de météorologie pratique. Paris. 1922. Deuxième édition.  
Bliss, George S. Weather forecasting. 5th ed. Washington. 1929. (U. S. Weather Bureau. Bull. 42.)  
Byers, H. R. Synoptic and aeronautical meteorology. New York. 1937.  
Defant, Albert. Wetter und Wettervorhersage. 2d ed. Leipzig. 1926.  
Georgii, Walter. Wettervorhersage; die fortschritte der synoptischen meteorologie. Dresden. 1924.  
Great Britain. Meteorological Office. The weather map; an introduction to modern meteorology. 2d ed. London. 1930.  
Henry, Alfred Judson. Weather forecasting from synoptic charts. Washington. 1930. (U. S. Dept. of Agriculture. Miscellaneous publication No. 71.)  
India. National institute of sciences. Proceedings. Vol. 5. Symposium on Weather Prediction. 1939.  
Namias, Jerome, and others. An introduction to the study of air mass analysis. Milton, Mass. The American Meteorological Society. 4th ed. 1938.  
Petterssen, Sverre. Kinematical and dynamical properties of the field of pressure with application to weather forecasting. Oslo. 1933.  
Petterssen, Sverre. Practical rules for prognosticating the movement and the development of pressure centers. Bergen. 1933. (Mimeographed.)  
Rouch, J. Les méthodes de prévision du temps. Paris. 1924.  
Sansou, J. La prévision du temps en agriculture. Paris. 1925.

- Schmauss, A. Das problem der wettervorhersage. 2d ed. Leipzig. 1937.  
 Shaw, Sir Napier. Forecasting weather. 2d ed. London. 1923.  
 U. S. Weather Bureau. Weather forecasting in the United States. Washington. 1916.  
 Van Mieghem, J. Prévision du temps par l'analyse des cartes météorologiques. Paris. 1936.  
 Weightman, R. Hanson. Forecasting from synoptic weather charts. Washington. 1936. (U. S. Dept. of Agriculture. Miscellaneous publication 236.)

## AERONAUTICAL METEOROLOGY

- Baldit, A. Les routes aériennes de l'Atlantique. Paris. 1928.  
 Dedeant, G., and Viaut, A. Manual de météorologie du pilote. Paris. 1936.  
 Georgii, Walter. Flugmeteorologie. Leipzig. 1927.  
 Gregg, Willis Ray. Aeronautical meteorology. 2d ed. New York. 1930.  
 Maguire, Charles Joseph. Aerology. A ground school manual in aeronautical meteorology. New York. 1931.  
 National Geographic Society. U. S. army air corps stratosphere flight of 1935 in the balloon "Explorer II." Washington. 1936.  
 Noth, Hermann. Wetterkunde für Flieger und Freunde der Luftfahrt. 2d ed. Berlin. 1934.  
 Sutcliffe, R. C. Meteorology for Aviators. London. 1939.  
 Taylor, G. F. Aeronautical meteorology. New York. 1938.

## AGRICULTURAL METEOROLOGY

- Henry, A. J., & others. Weather and agriculture. Washington, 1925. (U. S. Dept. of Agriculture. Separate from yearbook. 1924. No. 918.)  
 Holdefleiss, Paul. Agrarmeteorologie. Berlin. 1930.  
 Klein, Paul, & Sanson, Joseph. Météorologie et physique agricoles. Paris. 1925.  
 Smith, J. Warren. Agricultural meteorology. New York. 1920.

## ATMOSPHERIC ELECTRICITY

- American Institute of Electrical Engineers. Lightning reference book. New York. 1937.  
 Chauveau, B. Electricité atmosphérique. 3 volumes. Paris. 1922-25.  
 Covert, Roy N. Protection of buildings and farm property from lightning. Washington. 2d ed. 1930. (U. S. Dept. of Agriculture. Farmers' bull. 1512.)  
 Fleming, J. A., et al. Physics of the earth, vol. 8. Terrestrial magnetism and electricity. New York. 1939.  
 General Electric Review. Reprints of papers on lightning. Various authors. Schenectady. 1937.  
 Gockel, Albert. Das Gewitter. 3d ed. Berlin. 1925.  
 Kähler, Karl. Einführung in die atmosphärische Elektrizität. Berlin. 1929.  
 Peters, Orville S. Protection of life and property against lightning. Washington. 1915. (U. S. Bureau of standards. Technological paper 56.)  
 Schonland, B. F. J. Atmospheric electricity. London. 1932.  
 Swann, W. F. G. Atmospheric electricity. (In Journal of Franklin Institute, Philadelphia, Nov. 1919, pp. 577-606.)  
 U. S. Bureau of standards. Code for protection against lightning. Washington. 1929.  
 Voigts, Heinrich. Luftelektrizität. Berlin. 1927.

## FROST

- Reed, William Gardner. Frost and the growing season. Washington. 1918. (U. S. Dept. of Agriculture. Atlas of American agriculture, pt. 2, sec. 1.)  
 Young, Floyd D. Frost and the prevention of frost damage. Washington. 1929. (U. S. Dept. of Agriculture. Farmers' bull. 1588.)

## INSTRUMENTS, INSTRUCTIONS, TABLES

- Great Britain. Meteorological office. The computer's handbook. London. 1915-. [In course of publication, in parts.]  
 Great Britain, Meteorological office. The meteorological observer's handbook. London. 1934.

- Kleinschmidt, E., and others. Handbuch der meteorologischen Instrumente und ihrer Auswertung. Berlin. 1935.  
 Smithsonian Institution. Smithsonian meteorological tables. 5th ed. Washington. 1931.  
 U. S. Weather Bureau. Circulars. A. Instructions for obtaining and tabulating records from recording instruments. B. and C., combined, Instructions for cooperative observers. D. Instructions for the installation and maintenance of wind measuring and recording apparatus. E. Measurement of precipitation. F. Barometers and the measurement of atmospheric pressure. G. Care and management of electrical sunshine recorders. I. Instructions for erecting and using weather bureau nephoscope. L. Instructions for the installation and operation of class A evaporation stations. M. Instructions to marine meteorological observers. N. Instructions for airway meteorological service. O. Instructions for making pilot balloon observations. P. Instructions for making aerological observations. Q. Pyrheliometers and pyrheliometric observations. R. Preparation and use of weather maps at sea. Washington. [Various dates.]  
 U. S. Weather Bureau. Psychrometric tables. Washington. 1912  
 U. S. Weather Bureau. Instructions to storm-warning displaymen. Washington. 1912.  
 U. S. Weather Bureau. Instructions for installation and use of telethermoscopes. Washington. 1937.  
 U. S. Weather Bureau. International code for radio weather reports from ships. Washington. 1931.

## MARINE METEOROLOGY

- Allingham, William. A manual of marine meteorology. 3d ed. London. 1927.  
 Great Britain. Hydrographic department. Admiralty weather Manual. 1938.  
 Great Britain. Meteorological office. Marine observer's handbook. 6th ed. London. 1937.  
 Great Britain. Meteorological office. A barometer manual for the use of seamen; a text book of marine meteorology. 11th ed. London. 1932.  
 Great Britain. Meteorological office. A handbook of weather, currents, and ice, for seamen. London. 1935.  
 Russelvædt, Nils. Measurement of temperature on board ships. Oslo. 1936. (Geofysiske Publikasjoner Vol. XI. No. 10.)  
 Smith, L. A. Brooke. Wireless and weather; an aid to navigation. London. 1928. (Great Britain, Meteorological office, M. O. 297.)  
 Tannehill, I. R. Preparation and use of weather maps at sea. Washington. 1935. (U. S. Weather Bureau. Circular R.)  
 U. S. Weather Bureau. Instructions to marine meteorological observers. 6th ed. Washington. 1938. (Circular M.)  
 U. S. Weather Bureau. Average conditions of wind and weather, North Pacific Ocean. Washington. 1937.

## STORMS

- Algué, José. Cyclones of the far east. 2d ed. Manila. 1904.  
 Bowie, Edward H., & Weightman, R. Hanson. Types of storms of the United States and their average movements. Washington. 1914. (U. S. Weather Bureau. Monthly weather review. Supplement 1.)  
 Cline, Isaac M. Tropical cyclones. New York. 1926.  
 Fassig, Oliver L. Hurricanes of the West Indies. Washington. 1913. (U. S. Weather Bureau. Bull. X.)  
 Finley, John P. Tornadoes; what they are and how to observe them. New York. 1887.  
 Froc, Louis. L'atmosphère en extrême-orient; son état normal, ses perturbations. 2d ed. Paris. 1920. [Full account of typhoons.]  
 Garrett, E. B. West Indian hurricanes. Washington. 1900. (U. S. Weather Bureau. Bull. H.)  
 Iyer, V. Doraiswamy. Typhoons and Indian weather. (Mémoirs of the India meteorological department.) Delhi. 1936.  
 Laughton, L. G. C., & Heddon, V. Great storms. London. 1927.  
 Mitchell, Charles L. West Indian hurricanes and other tropical cyclones of the North Atlantic ocean. Washington. 1924. (U. S. Weather Bureau. Monthly weather review. Supplement 24.)  
 Also supplementary article of same title, Monthly weather review, vol. 60, p. 253, December 1932.

- Newnham, E. V. Hurricanes and tropical revolving storms. London. 1922. (Great Britain, Meteorological office. Geophysical memoirs No. 19.)
- Schubart, L. Praktische Orkankunde; mit Anweisungen zum Manövriren in Stürmen. Berlin. 1934.
- Tannehill, Ivan Ray. Hurricanes, their nature and history. Princeton. 1938.
- Tannehill, I. R. The hurricane. Washington. 1934. (U. S. Dept. of Agriculture. Miscellaneous publ. 197.)
- Visher, Stephen S. Tropical cyclones of the Pacific. Honolulu. 1925. (Bernice P. Bishop museum. Bull. 20.)
- Wegener, Alfred L. Wind- und Wasserhosen in Europa. Braunschweig. 1917.

## MISCELLANEOUS

- Baur, F. Einführung in die Grosswetterforschung. Berlin. 1937.
- Glazebrook, Sir Richard. A dictionary of applied physics. Vol. III. Meteorology. London. 1923.
- Great Britain. Meteorological office. Meteorological glossary. 3d ed. London. 1939.
- Haurwitz, B. The physical state of the upper atmosphere. Toronto. 1937.
- Humphreys, William J. Rain making and other weather vagaries. Baltimore. 1926.
- Humphreys, W. J. Weather proverbs and paradoxes. 2d ed. Baltimore. 1934.
- Inwards, Richard. Weather lore; a collection of proverbs, sayings, and rules concerning the weather. 3d ed. London. 1898.
- Lapp, John A. Meteorology as a career. The Institute for research. Chicago. 1938.
- Lettau, H. Atmosphärische turbulenz. Leipzig. 1939.
- Lexique météorologique. Paris, l'Office national météorologique. Fasc. I-VII, 1926-1931.
- Middleton, W. E. Knowles. Visibility in meteorology. Toronto. 1935.
- Perner, Joseph M., and Exner, Felix M. Meteorologische Optik. 2d ed. Wien, etc. 1922.
- Royal meteorological society. Some problems of modern meteorology. London. 1935.
- Seligman, G. Snow structure and ski fields, with an appendix on alpine weather. London. 1936.
- U. S. Weather Bureau. Weather folk-lore and local weather signs. Washington. 1903.

## CLIMATOLOGY

- Bonacina, L. C. W. Climatic control. 3d ed. London. 1927.
- Brooks, C. E. P. Climate. 3d ed. London. 1932.
- Brooks, C. E. P. Climate through the ages. London. 1926.
- Brooks, C. E. P. The evolution of climate. 2d ed. London. 1925.
- Edwards, K. C. The A B C of climate. London. 1930.
- Hann, Julius. Handbuch der Klimatologie. Vol. 1. 4th ed. (Revised by Karl Knobch). Stuttgart. 1932.
- Note.—[The second edition of this volume has been translated into English, with some additions, by R. DeC. Ward, New York, 1903, but the translation is out of print and rare.]
- Kendrew, W. G. Climate. 2d ed. Oxford. 1938.
- Köppen, W. Grundriss der Klimakunde. Berlin. 1931.
- Köppen, W., and Geiger, R., eds. Handbuch der Klimatologie. Vol. 1. Berlin. 1936.
- Miller, A. A. Climatology. London. 1931.
- Ward, Robert DeCourcy. Climate, considered especially in relation to man. 2d ed. New York. 1918.

## Climate and Health

- Büttner, K. Physikalische Bioklimatologie. Leipzig. 1938.
- Dorno, C. Klimatologie im Dienste der Medizin. Braunschweig. 1920.
- Lampert, H. Heilquellen und Heilklima. Dresden and Leipzig. 1934.
- Petersen, W. F. The patient and the weather. 3 vols. (in parts). Ann Arbor, Mich. 1934.
- Piéry, M., ed. Traité de climatologie biologique et médicale. Paris. 1934. 3 vols.
- Ward, R. DeC. The climates of the United States. Boston. 1925. (Chapter XXI, Climate and health.)
- Weber, F. Parkes, & Hinsdale, Guy. Climatology; health resorts; mineral springs. Philadelphia. 1902. 2 vols. (Cohen, S. S. A system of physiologic therapeutics, vols. 3 and 4.)

## CLIMATOGRAPHY

- Bartholomew, J. G. Physical Atlas, vol. 3. Meteorology. London. 1899.
- Clayton, H. Helm., et al. World weather records. Records of barometric pressure, temperature, and precipitation for 287 selected stations in different parts of the world. Washington. Smithsonian miscellaneous collections, col. 79, 1927. Supplement covering same stations for 1921-1930, vol. 90, 1934.
- Hann, J. Handbuch der Klimatologie, 3d ed., Stuttgart, 1908-1911. Vol. 2. Torrid zone; vol. 3. Temperate and frigid zones.
- Kendrew, W. G. Climates of the continents. 3d ed. Oxford. 1937.
- Köppen, W., & Geiger, R., eds. Handbuch der Klimatologie. Vol. 2. America, vol. 3. Europe and Northern Asia; vol. 4. Southern Asia and Australia, vol. 5. Africa, Oceans. (Vol. 2 complete. Other volumes in course of publication, in parts.)

## Climate of the United States

- Henry, A. J. Climatology of the United States. Washington. U. S. Weather Bureau Bulletin Q. 1906.
- U. S. Department of Agriculture. Atlas of American agriculture. Washington. 1936.
- U. S. Weather Bureau. Atlas of climatic charts of the oceans. Washington. 1939.
- U. S. Weather Bureau Bulletin W. Summaries of climatological data by sections. Washington. 1st ed. 2 vols. 1912. 2d ed. (revised). 3 vols. 1926. A third edition (revised) is complete in parts.
- Ward, R. DeC. The climates of the United States. Boston. 1925.

## LEADING METEOROLOGICAL JOURNALS

## Periodicals

- Annalen der Hydrographie und maritimen Meteorologie. Berlin, etc. 1873-.
- Beiträge zur Physik der freien Atmosphäre. Strassburg. 1904-.
- Bulletin of the American meteorological society. Milton, Mass. 1920-.
- Marine observer. London. 1924-.
- [Published by Meteorological office.]
- Meteorological magazine. London. 1866-.
- [Published by Meteorological office.]
- Météorologie. Paris. 1925-.
- [Published by Société météorologique de France.]
- Meteorologische Zeitschrift. Braunschweig, etc. 1884-.
- Monthly weather review. Washington. 1872-.
- [Published by U. S. Weather Bureau.]
- Quarterly journal of the Royal meteorological society. London. 1871-.
- Zeitschrift für angewandte Meteorologie. Berlin. 1885-.

## Serials

- Det Norske Meteorologiske Institutt. *Geofysiske Publikasjoner*. Oslo. 1920-.
- Det Norske Videnskaps—Akademi. *Astrophysica Norvegica*. Oslo. 1935-.
- Deutsche Seewarte. *Aus dem Archiv der Deutschen Seewarte. Hamburg*. 1878-.
- Deutsches Reich. *Reichsamt für Wetterdienst. Wissenschaftliche Abhandlungen*. Berlin. 1935-.
- Great Britain. Meteorological office. *Geophysical memoirs*. London. 1911-.
- India meteorological department. *Scientific notes*. Delhi. 1926-.
- Massachusetts institute of technology. *Papers in physical oceanography and meteorology*. Boston. 1930-.
- Memoirs of the Royal meteorological society. London. 1926-1939.
- Sweden. *Statens meteorologisk—hydrografiska anstalt. Meddelanden*. Stockholm. 1920-.
- Veröffentlichungen des Geophysikalischen instituts der Universität Leipzig. 1913-.
- Veröffentlichungen des Meteorologischen instituts der Universität Berlin. 1936-.

## METEOROLOGY IN RELATION TO STREAM FLOW

## Works recommended for Weather bureau river district centers

- Hazen, A. *Flood flows*. New York. 1930.
- Houk, I. E. *Rainfall and run-off in the Miami Valley*. Dayton. 1921.
- Keulegan, G. H. *Laws of turbulent flow in open channels*. Journal of research of National bureau of standards. Vol. 21. 1938.
- Mead, D. W. *Hydrology*. New York. 1919.
- Meyer, A. F. *Elements of hydrology*. New York. 1917.
- Miami conservancy District. *Storm rainfall of eastern United States*. 2d ed. Dayton. 1936.
- Newell, F. H. *Water resources, present and future uses*. New Haven. 1920.
- Rouse, Hunter. *Fluid mechanics for hydraulic engineers*. New York. 1938.
- Schaffernak, F. *Hydrographie*. Vienna. 1935.
- Thomas, H. A. *The hydraulics of flood movements in rivers*. Pittsburgh. 1937.
- Tolman, C. F. *Ground Water*. New York. 1937.
- Transactions of the American Geophysical Union, Washington. 1933-.

## RAINFALL MAPS OF CUBA

By THOMAS W. CHAMBERLIN

[State Teachers College, Johnson City, Tenn., May 1930]

A set of monthly rainfall maps<sup>1</sup> of the island of Cuba, based on the records<sup>2</sup> of 19 stations, was published in May 1928. Since that time additional data<sup>3</sup> have been recorded warranting a new set of maps, which, although similar in the major trends of the isohyets, show more local detail than has been possible previously. Of the 171 stations used in this study, 47 had from 4- to 6-year records, 79 from 7- to 11-year records, 27 from 12- to 20-year records, and 18 had from 21- to 67-year records. These included two stations on the Isle of Pines. The unreliability of short-term rainfall records is fully realized, but in all cases the longest record has been used in determining the final placement of the isohyets.

Cuba, about the size of Pennsylvania, has an area of 44,000 square miles. It is two and one half times as long as Pennsylvania and attains its maximum width of slightly over 80 miles in central Oriente Province. In contrast to most other islands of the West Indies, Cuba is essentially lowland, being distinctly mountainous or hilly in less than one-fourth its area. The construction of isohyets in these small, but relatively remote, areas must of necessity be theoretical, due to the paucity of stations in the sparsely inhabited uplands.

Cuba is under the influence of the trade winds throughout the year. In general, the wind prevails from the northeast from October to April and from the south and southeast during the summer months. The shift to the southeast in April is due to the general continental heating and lowering of pressure to the west and northwest of Cuba causing the trades to be drawn toward the North American continent in summer.

Pena Blanca, number 3 on the key map of Cuba, in Pinar del Rio Province, with a 5-year record, has the island's maximum annual rainfall of 79 inches. Union de

Reyes, number 4 in Matanzas Province, with a 21-year record, ranks second with a 70-inch average.

The United States Naval Station at Guantanamo Bay, number 36 in Oriente Province, with a 10-year record, has the island's minimum annual average, slightly over 28 inches. The plains of the Guantanamo Bay area and the coast east of them are described by Bennett<sup>4</sup> and Leon<sup>5</sup> as the driest parts of the island.

The rainfall regime over most of Cuba has May-June and September-October double summer maxima. The only exception to this is the northeastern part of the island which experiences May-June and November maxima. Unlike the other portions of Cuba, this section receives its greatest rainfall in the months from October through February. The average annual rainfall of all stations on the island is 52.5 inches. In general the interior of the island receives more rainfall than the coastal areas.

From 50 to 75 percent of the area of Cuba receives less than 1 inch of rainfall in December and February; sections receiving more rain during these months are the mountains and north coast, since the trades are from the northeast at this time. In January there is a slight increase throughout the island. As the trades shift to the east and southeast in May, the south coast receives more rain. Thundershowers are most prevalent over the island from May to November, especially in the interior; during these months, the northeast coast receives less than the rest of the island.

The secondary rainfall minimum in July and August is associated with higher barometric pressure. In September and October the maximum is brought about by lower pressure, by occasional hurricanes, and, according to the late Dr. O. L. Fassig, by temporary "rapid increases in the depth of the trade winds which bring about a conflict with the so-called antitrades."<sup>6</sup> The increased rainfall due to orographic precipitation in the mountains and major hill areas shows up on most of the monthly maps.

<sup>1</sup> Fescue, Edwin J. "Rainfall Maps of Cuba." Mo. WEA. REV., 56:170-173, May 1928.  
<sup>2</sup> Fassig, Oliver L., *Rainfall and Temperature of Cuba*, Washington D. C.: Tropical Plant Research Foundation, Bulletin No. 1, 1925.

<sup>3</sup> From 1927-33 the Cuba Sugar Club kept records of more than 1,000 rain gages scattered over the sugar-producing lands of Cuba. Mr. Charles Thrall, formerly a director of the now disbanded Sugar Club furnished the author with data published by the club during that period. These statistics, together with those published by W. W. Reed, Dr. O. L. Fassig, the United States Weather Bureau in its *Climatological Data, West Indies and Caribbean Service*, and data furnished by the United States Guantanamo Naval Station, form the bases for the construction of the maps accompanying this study.

<sup>4</sup> Bennett, Hugh H. and Robert V. Allison, *The Soils of Cuba*, Washington, D. C.: Tropical Plant Research Foundation, 1928.

<sup>5</sup> Shreve, Forest, editor, *Naturalists Guide to the Americas*. Section on Cuba by Brother Leon. Baltimore: Williams and Wilkins Co., 1926.

<sup>6</sup> Fassig, O. L., "The Trade Winds of the Eastern Caribbean" Transactions of the American Geophysical Union, Fourteenth Annual Meeting, 1933.